Karolinska Institutet

Institutionen för klinisk vetenskap, intervention och teknik (CLINTEC)

Speech and voice characteristics in multiple sclerosis and cervical spinal cord injury: descriptive studies and effects of respiratory training

AKADEMISK AVHANDLING
som för avläggande av medicine doktorsexamen vid Karolinska Institutet offentligen försvaras i föreläsningssal R 64, Rehabgatan 64, plan 6, Karolinska universitetssjukhuset, Huddinge

Fredagen den 29 november 2013, kl 09.00

av
Kerstin Johansson
Leg logoped

Huvudhandledare:
Medicine doktor Ellika Schalling
Karolinska Institutet
Institutionen för klinisk vetenskap, intervention och teknik (CLINTEC)
Enheten för logopedi

Bihandledare:
Professor Lena Hartelius
Göteborgs universitet
Sahlgrenska akademin
Institutionen för neurovetenskap och fysiologi
Sektionen för klinisk neurovetenskap och rehabilitering
Enheten för logopedi

Professor Sten Fredrikson
Karolinska Institutet
Institutionen för klinisk neurovetenskap
Sektionen för neurologi

Fakultetsopponent:
Medicine doktor Jenny Iwarsson
Köpenhamns universitet
Institutionen för nordiska studier och språkvetenskap

Betygsnämnd:
Professor Jörgen Borg
Karolinska Institutet
Institutionen för kliniska vetenskaper, DS

Docent Stellan Hertegård
Karolinska Institutet
Institutionen för klinisk vetenskap, intervention och teknik (CLINTEC)
Enheten för öron-, näs- och halssjukdomar

Docent Kristina Hansson
Lunds universitet
Institutionen för kliniska vetenskaper
Logopedi, foniatri och audiologi

ABSTRACT

Introduction and aims: Respiratory function may be impaired in multiple sclerosis (MS) and cervical spinal cord injury (CSCI), but few studies have reported voice and speech data before and after respiratory training in MS and CSCI. The aims of these studies were therefore to provide a detailed description of voice and speech following CSCI, and to evaluate effects of glossopharyngeal breathing (glossopharyngeal pistoning for lung insufflation, GI) and expiratory muscle strength training (EMST) on respiration, voice and speech, and communication in individuals with MS or CSCI.

Methods: Participants were 26 individuals with CSCI, a control group (CG) of 19 matched non-injured individuals, and six individuals with MS. The project included three group studies and two single subject studies (one being repeated across five participants). The following data were analyzed: respiratory, acoustic, aerodynamic, and anamnestic information, self-reported voice and speech function and limitations, and perceptual voice and speech assessment performed by experienced speech-language pathologists.

Results: A majority of the participants with CSCI experienced long-standing voice changes and used a range of strategies to compensate for the limited respiratory function. The Sw-VHI scores showed significantly more pronounced voice problems in the group with CSCI, and their results on maximum respiratory, voice, and speech performance tasks were significantly worse when compared with the CG. Participants with a vital capacity (VC) of less than 50 % of the expected performed significantly worse than participants with a VC above 50 % of the expected, and the level of injury had an impact on respiratory function in complete CSCI. The listeners rated the presence of the perceptual voice and speech characteristics to be low in the group with CSCI, but harshness and vocal fry were present to a higher degree, and in more participants with CSCI, and loudness was rated lower than normal compared with the CG. There were both short- and long-term effects on voice and speech, including increased loudness and improved phonatory stability in the seven individuals with CSCI who used GI. Long-term effects were particularly marked in the participant with MS, who showed continued improvements of respiration and speech up to the last follow up 20 months after intervention, both on habitual speech measures and when using GI. Following EMST, some of the five participants with MS showed increases in maximum expiratory pressure, maximum phonation time, loudness and phonatory stability, but the results suggested larger effect sizes in the two participants with mild MS, who were able to train with a higher load. Self-reports indicated effects on communicative participation in MS after GI and EMST.

Conclusions: CSCI can result in long-standing changes in voice function secondary to the respiratory impairment, especially in challenging speech tasks. Therefore, individuals with CSCI risk voice fatigue and restrictions in communicative participation. The voice and speech changes following CSCI are perceptually subtle, but can be identified by posing questions or using instruments about self-perceived limitations, and by including more challenging speech tasks in the assessment. GI can be considered in speech pathology intervention for patients with CSCI and MS. EMST may have additional positive effects, why more clinical investigations about the outcomes of this treatment are needed.

Key words: acoustic analysis, perceptual assessment, cervical spinal cord injury, communication, dysarthria, expiratory muscle training, glossopharyngeal breathing, maximum phonation time, multiple sclerosis, respiration, voice, self-reports, sound pressure level, speech, subglottal pressure, Voice Handicap Index, voice range profile

ISBN 978-91-7549-330-5